

altered his opinion since he presented his paper on March 19, 1883, to the Academy of Sciences; but, as I have shown, *he did make the statement he now repudiates*; and even if the result of my calculations, founded upon that statement, do not agree with what he now considers to be necessary, he has no right to attribute the discrepancy to any error of mine.

M. Lœwy then proceeds to show that it *is* possible to attach a weight of three-quarters of a ton to end of cross tube. This, I need hardly say, I never disputed; what I did say was, "The absurdity of hanging this three-quarters of a ton" (*i.e.* weight of mirror, objective, and all their supports and attachments) "on end of cross tube, *and yet calling the instrument one of precision*, is too apparent to need demonstration." If I were asked if it would be possible to hang three-quarters of a ton on each end of the Greenwich transit, I might be able to reply in the affirmative, but if I were asked to guarantee that the instrument would, under its new conditions, be as perfect an instrument of precision as it is in its present state, I would not be inclined to risk my "*reputation*" by any such guarantee, and yet M. Lœwy compares the equatorial *coudé* to a spirit instrument in stability.

Lastly, on the question of expense. M. Lœwy is anxious to know where I obtained my information, but as I am content to accept his own figures (see his letter in your issue of May 1), so far as the equatorial *coudé* is concerned, there is no occasion to discuss this point. I take the 12-inch size, as it is the nearest to the only one completed, and most likely to be accurate. A 12-inch equatorial *coudé* is estimated at 44,000 francs, *i.e.* say 1760*l.*

Now, in estimating the relative costs of the two forms, your readers will agree with me that for our purposes the fair comparison is between the equatorial *coudé* and such equatorials as are most generally in use in this country, and it is well known that for 1760*l.* a first-rate 12-inch equatorial and dome can be procured, and *this is as nearly as possible what I said*, and I have to thank M. Lœwy for furnishing me with materials to prove my case with so little trouble.

My paper at the Royal Dublin Society (so far as concerned the equatorial *coudé*) was mainly confined to showing that in consequence of its complication it presented many difficulties in its manufacture, particularly for large sizes, and I considered (as I do still consider) that too much was sacrificed in endeavouring to make it an instrument of precision, and to obtain universality. The very fact of its being difficult to construct renders any success the more creditable, and I gladly take this opportunity of expressing my admiration for the excellence of the optical work of the Messrs. Henri, which appears to have withstood the enormous strain put upon it by the peculiarity of construction of the instrument. I still consider, and in this opinion I am joined by the several astronomers of eminence to whom I have spoken on the subject, that the good results are due to the excellence of the optical work, and have been obtained in spite of, and not by reason of, the peculiar form of the instrument.

And now I would say a few words generally on the comparison which has been instituted between the two forms. The claims of the instrument which I propose are very modest. I simply claim for it that by its peculiar construction I can obtain an instrument of large aperture at about one-fourth the usual cost, and that the observer can be situated in a most comfortable position, and free from all the various inconveniences of ordinary observing. I do not claim that the instrument will be one of precision, or that the images will be better after reflection from the mirrors, or that it will be universal, or that it will do all and everything which the equatorial *coudé* will do at four times the cost. What the equatorial *coudé* claims your readers already know. Like many other matters, this also will probably resolve itself into one of cost. If a director of an observatory has 1760*l.* at his disposal, it is for him to decide whether he will have a 12-inch equatorial *coudé*, which commands the whole visible heavens, or a 24-inch telescope on my plan, sacrificing in this case about 20° near the Pole; or, putting it another way, he may consider the question whether he will spend 1760*l.* on a 12-inch equatorial *coudé* or 500*l.* on one of my form of same aperture.

On this matter I shall have more to say in my second letter, in which also I propose to answer all the various objections M. Lœwy has raised to my form. It may, however, be interesting for him to learn that, with a single unimportant exception, he has not raised an objection which has not already been discussed and provided for in the new instrument; but he has suggested to me another objection to the equatorial *coudé* which I shall also treat of in that letter.

HOWARD GRUBB

Rathmines, Dublin, May 19

The Earthquake

My yacht, the *Glimpse*, lay on the ground in the River Colne at East Donyland, about half a mile above Wivenhoe, and as soon as I was able I joined her in order to study the effects of the late earthquake. I remained in the district about a fortnight, and examined the greater part of the focus of disturbance, over an area of about eight miles long by six broad. I distinguished on the ordnance map by appropriate marks (1) those places where the shock had been so violent that not only nearly all the chimneys had been knocked down but a large proportion of the house walls cracked and some boundary walls thrown down; (2) those where it had been less violent, many of the chimneys having been thrown down, but few or no houses cracked; and (3) those where it had been only sufficiently violent to throw down a few isolated chimneys. This third district extends in some directions much beyond the part examined. District No. 2 may be said to trend from Wivenhoe south-west to somewhat south of Little Wigborough, but sends a small, narrow branch north-west up the Colne valley to Colchester. The main part of District No. 1 is at Peldon, Langenhoe, and Strood Mill, but there are two well-marked outliers, one at Wivenhoe and another at Mortimer in Mersea Island. At and near Wivenhoe the intensity of the shock seems to have been greatest at low levels, and such a supposition would explain the character of that outlier, but no such explanation is applicable to the outlier at Mortimer, since the chief damage there is at a high level, and I was unable to discover any reason for its local character.

A great part of my attention was directed to such facts as indicated the direction in which the disturbance moved. The mate of the *Glimpse* was on deck, and says that the yacht was first, as it were, moved violently forwards to the west, and then even more violently backwards to the east. All the circumstances of the case make this a very good observation. In trying to determine the direction of the shock from the effects, I have taken great care to select such cases as would mark the first shock, and not the recoil. Unless this be done, no true result could be obtained, since very commonly the chimneys at one end of a house have been thrown down by the direct shock and those at the other end in the opposite direction by the recoil. On the whole I was able to observe nineteen cases which I looked upon as satisfactory. Almost all these vary from east to south. Perhaps the shock was rather more from the east at Wivenhoe than at Peldon. The mean of the whole is very nearly true south-east, which may be said to agree with the axis of chief disturbance as laid down by me on the map. The only case which is doubtful is that of the church at East Mersea. The manner in which two portions of the tower have been thrown down seem to indicate a shock from north-west. If this could be relied on with perfect confidence, it would show that the church lay on the south-east side of the vertical line, but I saw nothing else to confirm such a conclusion, and I think it quite as probable that the damage was done by the recoil which over the greater part of the district was from that same north-west direction. If this supposition is correct, the shock came up from below somewhat obliquely from south-east under East Mersea, where scarcely any damage has been done, and was most violent along the stroke of the wave at a distance of about three miles to the north-west. This and the general character of the area of chief disturbance seems to me to point to some very irregular distribution of hard rocks at a considerable distance below the surface. II. C. SORBY

Yacht *Glimpse*, Queenborough, May 25

IN your issue of the 8th inst. (p. 31) Dr. J. E. Taylor draws attention to the fact that sound preceded the Langenhoe earthquake for an appreciable period of time. A similar phenomenon has often been recorded, but as I cannot just now quote another instance, allow me to put forward a personal one.

On the morning of Monday, July 11, 1853, I had just gone to bed when I heard a heavy fast-approaching rumbling sound coming from the direction N.W. $\frac{1}{4}$ N. I was in St. Jean de Luz, and had stopped at an inn which skirts the high road from Bayonne to Madrid. The noise was coming nearer with the speed of an express train, and knowing that the only heavy coach which plied in those days could not pass at such an hour, I concluded that an earthquake was coming and got up to look at my watch, which I had left on a table at the opposite corner of the room; it was 20m. 8s. past midnight. When the noise seemed to issue from the ground *under me*, the whole house shook; it was then 24m. 8s. past midnight. Although occurring at a time

when most of the inhabitants were asleep, this earthquake was recorded in all neighbouring villages and at Vera, on the south of the Pyrenees chain. This contradicts the observations made in Japan, where mountains seem to stop earthquakes. Taken unawares at St. Jean de Luz, I did not note down how long the sound lasted before and after the shock. This should be attended to, if possible, in all similar phenomena, for we have as yet no permanent self-recorder of sound.

Although notable earthquakes are of rare occurrence in Europe, slight ones frequently happen. I have observed two microscopical ones near Hendaye. Our imperfect knowledge of their times and causes would be improved if our meteorological observatories had proper seismometers telling their own tales. Perhaps they should be of three kinds : for serious earthquakes, for slight shocks, and for earth-tremors.

Paris, May 26

ANTOINE D'ABBADIE,
de l'Institut

THE earthquake was felt by an invalid in bed at Dudbridge, a mile south-west of Stroud, Gloucestershire. The house stands on the Middle Lias. It was also felt at Stonehouse, three miles west of Stroud on the Lower Lias. The New Red dips under the Lias, about seven miles west of Stonehouse, at the well-known section at Westbury-on-Severn. It is presumed that the Carboniferous Limestone exists under the New Red. It is visible three miles to the west of Westbury.

May 23

A. SHAW PAGE

Instinct in Birds

I READ with special interest the letter signed "Wm. Brown" in NATURE of the 15th (p. 56). I regret I cannot see the letter to which it refers. My excuse for intruding on your limited space is that I have something to say about a magpie's nest. My text is words in Mr. Brown's letter, "I have often seen the nest shot down." Some years ago seeing a magpie fly from her nest I climbed the tree to see what was in it. I found six eggs, but *not magpies'*. They were *starlings'* eggs on which the magpie was sitting. I visited the tree several times, and always found the magpie sitting on the starlings' eggs. To my great regret, on finally coming to see how the magpie and her foster brood were getting on, I found a shot-hole through the nest, and magpie and eggs knocked to pieces.

R. S. S.

Edinburgh, May 21

P.S.—My regret was the greater as I could easily have prevented this by asking a neighbour's keeper to let the nest alone. The magpie lays as a rule seven eggs. There were six starlings' eggs in the nest. I saw no starling near the place, and as it was in the middle of a dense fir wood, I was the more astonished to see starlings' eggs there.

A Remarkably Brilliant Meteor

TO-NIGHT, about 10.45 p.m., I was "stepping westward," about half a mile east of my house. Suddenly the ground before me was lighted up with noontide splendour by a luminary that was above me and behind me. Looking back I saw a meteor a good deal east of the Great Bear, and nearly as high in the sky. It was about as big as Venus, and of the same hue. It was speeding from north to south with a slight descent. Its course very soon came to an end. It left behind it a streak of duller lustre; this phosphorus-like trail vanished almost at once. The career of this meteor while that body was visible here, lasted little, if at all, longer than a minute, but its light was remarkably brilliant.

JOHN HOSKYNs-ABRAHALL

Combe Vicarage, Woodstock, May 20

Right-sidedness

AN unprofessional account of a case of paralysis lately in the West London Hospital may be of interest as corroborating the assertion of Mr. Wharton (in his letter of March 20) that in paralysis of the left side it is the right eye which suffers, and *vice versa*. The left arm and leg of a child in the above hospital (whom I only knew as "Alice") were in almost constant jerking motion, and the left side of the face was motionless. The left eye, however, was normal and bright; while on the right side of the face, which did all the talking and laughing, the eye was half closed, and one could see under the drooping eyelid that the pupil was dilated till but a narrow margin of iris was visible.

E. H.

MODERN TRAVEL—A SCIENTIFIC EDUCATION

THE teaching of geography has come to rather a sad pass in this country, as was evident from the address of the President at the Anniversary of the Royal Geographical Society on Monday. The Society's examiner, Prof. Moseley, reports that it is entirely neglected in our public schools; and the Council of the Society have withdrawn the public schools medals which they have awarded for years, simply because there are so few candidates for them. In our great public schools geographical teaching has no recognised place; if taught at all it is only as a voluntary subject, which may or may not be taken at the caprice of the boys. Some attempt has been made to methodise the teaching of the subject in schools under Government inspection, but so far the result has not been very successful. No doubt the Science and Art Department and the University examiners have done much to improve the teaching of what is known as physical geography in our middle-class schools; but at the very best we are a long way from perfection in this important branch of education, which, were it not for unintelligent teachers and dry text-books, ought to abound with interest. One serious defect in our system of teaching the subject is the want of proper apparatus; maps are good enough in their way, but it is not easy to persuade the pupil that they represent anything more than a flat surface. They are a poor substitute for the models which we find in some Continental schools, supplemented as these are by large-scale, well-executed pictures of the leading natural and artificial features with which geography deals. If Miss North's gallery of pictures at Kew could be taken round the country at intervals for exhibition to our schools, it would do more for giving a real conception of what geography is than many text-books. Let us hope that the step taken by the Royal Geographical Society, in appointing an inspector to visit Continental schools and report on the whole subject, will lead to real reform.

Of course the most effective and impressive method of education in geography would be to take the pupil all over the world, and let him see with his own eyes the many wonderful and beautiful features of our earth, which as lists of dry names weary his soul in his text-book. This is a method recently followed to some extent in certain of the French high schools. The best pupils are taken during the vacation to some important foreign centre, like London or Berlin, Christiania or Stockholm, from which excursions are made to the leading natural and artificial features of the country. Every tourist is indeed more or less of a practical geographer, finding fresh energy, education, and interest in those very things which when at school he abhorred. But we fear that many tourists pass through a country, if not with their eyes closed, at least without any training whatever as to what they are to look for; and unless the best-intentioned tourists have been so far instructed, their travels will do them little good. Hence the great educational value of a carefully-compiled guide-book; and how important such a guide-book might be made as a means of geographical and scientific instruction may be seen from the handsome "Orient Line Guide" before us.¹ It is in most respects very different from any of the volumes with which Murray and Baedeker have made us familiar. It is meant neither for knapsack nor pocket, but evidently for the saloon table. It is a broad folio, handsomely printed and abounding in fine large-scale illustrations and maps by Maclure and Macdonald. Every one who has gone a long voyage must have felt its tedium in spite of amusements of all kinds; but with the aid of the "Orient Guide" every day ought to bring fresh interest and fresh means of instruc-

¹ "Illustrated Guide of the Orient Line of Steamships between England and Australia." Issued by the Managers of the Line. (London: Maclure and Macdonald.)